A REORGANIZED COURSE IN JUNIOR HIGH-SCHOOL ARITHMETIC

The National Committee on Mathematical Requirements, in its preliminary report on Junior High School Mathematics, invites " criticisms and discussions " of the report and offers to serve as a " clearing-house of ideas and material " sent to the committee.

The material here submitted has been tried out in the seventh and eighth grade classes of Fairmount Junior High School in Cleveland, Ohio, with very satisfactory results. Its place in the curriculum, however, is not of as much concern as is the unbroken chain of related topics. The plan is to present, as one unit, the cumulative business ideas which come under the heading, " The Applications of Percentage."

The pupils are supposed to have been well drilled in the four fundamentals with respect to integers, common and decimal fractions, and the interchanging of common fractions and per-cents. The meaning of per cent., finding any per cent. of a number, finding what per cent. one number is of another, finding a number when a certain per cent. of it is known, become more familiar when used in connection with the work to be outlined, though there should be some previous understanding of these operations. The equation method of solving indirect problems is gradually developed by using statements which, when abbreviated, form an equation. The pupils readily see the reason for, and the meaning of the abbreviations and the simpler equation principles are accepted and used. The use of this method is never forced, but is considered a convenience.

The necessity of presenting to the pupils' minds new material for thought which can be attached to ideas already known by them, is recognized, and this recognition has been a guide in the formation of the following outline.

The activity of buying and selling things for the purpose of making money is very familiar to pupils and is therefore the first topic studied. There is invariably, already in the pupils'

minds, a wealth of ideas on this subject commonly named Profit and Loss, and the accumulation of information begins by the teacher suggesting business transactions which will naturally introduce the ideas of gross gain, overhead expenses, net gain, loss, gain and loss per cents.

When these ideas are firmly fixed in mind by much oral and written work, questions concerning the growth of a business are brought up. One of the overhead expenses mentioned was, no doubt, advertising. Having in mind the topic Commercial Discount, the teacher asks the pupils to bring to class newspaper advertisements, announcing sales, which have the former price as well as the sale price given. In this way commercial discount is seen to be a very common and popular business activity. In making comparisons of the discounts allowed on articles in one or several advertisements, the need of the basic per cent. standard is felt and rates of discounts are figured and studied with intelligence and interest.

Discussions about the sales, as to whether they aid or hinder business, keep in mind the previous work. In these discussions the pupils give probable reasons for the discount sales. Other reasons for discounts such as cash payments, being an employee in a store, etc., should be brought to mind.

The subject of *successive discounts*, generally such a stumbling block, has been presented by imagining a clerk in a store which allows its employees a 10 per cent. discount on articles purchased by them from the store. The clerk buys an article which is selling at a 25 per cent. discount. If allowed his 10 per cent. discount on sales, as is often the case, the sum discounted would be the sale price, not the marked price. Such an example of successive discounts is followed by other cases, such as when several reductions are allowed on catalogued prices.

Do salesmen increase the business of a firm? Comparisons of salesmen having characteristics which are detrimental or advantageous to their selling ability, are made. Would it be fair to pay them all the same salary? If not, what is a fair way of remunerating them? By such questions *commission*, the method used in paying newsboys as well as high class salesmen for services rendered, is introduced. The various kinds of

work paid for on the commission basis are introduced in problems. The reasonableness of the accepted rule that the commission agent receives a certain per cent. of the money received or spent for goods or collected for his employer, is recognized.

By this time the problems begin to show the cumulated ideas. Bills, properly made out, totaled, discounted, and receipted, may be used to figure the salesman's commission. Commission is considered an aid to business and that is kept in the minds of the pupils, by the teacher, in guiding discussions and giving examples.

We cannot go very far in the study of business transactions without understanding situations involving the borrowing and loaning of money. We reach the subject of *interest* on money through the channel of *rent*. Articles may be bought and sold for profit. They may also be loaned for profit. In considering various things which may be rented, the time element comes in. A house may be rented by the month, an automobile by the hour, a summer cottage for a six-month period, etc. When money is rented, a certain per cent. of it is charged for a year's time. So we obtain the rule for finding the interest on money loaned:

> The principal, multiplied by the rate per cent., multiplied by the time expressed in years, equals the interest.

This rule shortened into the formula, $P \times R \times T = I$, affords a means of solving interest problems requiring the time, or the rate, or the principal, as well as the interest.

The transition to the study of *banking* follows naturally. Three important functions are considered: (1) That of the savings department, (2) that of the checking department, and (3) that of the loaning department.

The first function presents the twofold idea of an accommodation to the depositor as well as to the bank. The depositor loans the money to the bank, the bank pays interest for the money. Much use is made of bank forms easily obtained from banks: The identification card, bank book, deposit slip, withdrawal slip, etc. By making in the bank book entries of interest when due, the idea of *compound interest* is clarified,

and an incentive to save is born in the mind of many a pupil. When the principal of compound interest is understood, use is made of a compound-interest table.

The second function, that of the checking account, is also taught by means of the bank forms. In considering the depositing of money, emphasis is laid upon the fact that the bank book is a receipt given to the depositor, and only the bank records the deposits therein. In withdrawing money the check is compared with a letter written to a friend who is taking care of some money for the writer of the letter; *e.g.*,

Cleveland, Ohio,
Sept. 4, 1920.

My dear John:

Upon his request, kindly pay to Arthur James five dollars ($5.00) of the money you are keeping for me.

Yours truly,
(Signed) HARRY LONG.

Cleveland, Ohio,
Sept. 4, 1920.

The Detroit Av. Bank

Pay to the order of Arthur James 5\frac{00}{100}$

Five and $\frac{00}{100}$.....Dollars.

HARRY LONG.

The seriousness of an overdrawn account, as well as pride in being able to keep track of one's money, are incentives for accuracy in keeping the stubs. Situations are presented for practice which involve the making of several checks and the keeping of corresponding stubs.

The meaning of indorsement and the proper way to indorse a check are emphasized. The accommodation of being able to cash a check in a bank where one is favorably known, even if the check is drawing money from another bank, is brought to the attention of the pupils. The explanation of the adjustment of several banks' accounts through the clearing house is made by having the pupils act out the situations involved.

The class is divided into four or five bank groups, a name of a bank being assigned to each group. Each pupil makes out checks in favor of some one in the class, who represents a depositor in a different bank. When received, these checks must be properly indorsed and presented to the payee's bank

teller (a pupil in each bank group). When all have done this, it is supposed to be the end of the day. Then a representative from each bank goes to the clearing house (the back of the room) where the various banks settle with each other in the customary systematic way explained to them by the teacher. Returning to their bank groups, each representative has the checks which are now *vouchers*. These eventually reach the payer.

The third function, that of the loaning department, necessitates the study of a *promissory note*, which is compared with a letter conveying the needed information as was the check. The various kinds of securities: (1) personal, (2) real estate (mortgages), and (3) collateral are made known. What is meant by *foreclosing a mortgage* and what is meant by *equity* are explained. *Bank discount* of both noninterest-bearing and interest-bearing notes is studied in this connection, but the more customary *commercial draft* receives more attention.

The various ways of sending money out of town: stamps in a letter, for payment of very small amounts; postal money orders; bank checks and drafts; and telegraphing money are studied, along with their respective expense.

This is followed by the study of the different ways of sending things out of town: Parcel post, freight, express, trucks and aeroplanes, making, as accurately as possible, a comparison of the expenses connected with these methods.

Of course all of this work involves arithmetical computations, after the reasons for such are understood and toward the end of the course much time is spent in working problems which are in groups of five or six, having to do with closely interwoven business situations concerning one small group of people.

Care is taken to avoid such an arrangement of problems as would cause the whole set of examples to be wrong because of a mistake made in the first or even the second example. These examples afford splendid reviews and in such settings the ideas often become more clear to the pupils.

(The material up to this point may be easily completed in one semester. The following is a continuation to be studied the next semester.)

The next main topic is *taxes*, which is approached gradually through the following channels of thought:

(1) Personal expenses. How they are met.
(2) Family expenses. How they are met.
(3) Club expenses. How they are met.
(4) City expenses. How they are met.

The study of *personal budget* is made. Sensible percentages of the outlay of money are considered for the various apportionments. The advantages of allowances and the accurate keeping of personal accounts are emphasized.

Then the family expenses are considered. *Budgets for families* of various sizes with different incomes are studied, and in making budgets we have practical applications of per cents. Family accounts are kept, and in so far as is practicable the former topics are reviewed. Regular salaries versus incomes based upon commission are compared and ideas of thrift are presented.

The *club budget*, depending upon the type of club, affords an opportunity for constructive suggestions for worth-while clubs. The expenses, met by dues and assessments, bring out the simple phases of ratio and proportion. The *city budget* is always a revelation to the pupils. This study invariably awakens in their minds appreciation of the advantages of schools, libraries, paved streets, lighted streets, blessings which they had taken for granted before. They are then prepared for a fair way of paying for these advantages. The bulk of the money must come from the property owners. So they see a need for the valuation of the property, as ordinarily made by assessors. The money spent in paying for the expenses comes mainly from this assessed valuation. In figuring the part of the assessed valuation, which this tax represents, the *rate of taxation* is derived. Ratio and proportion are again made use of, in seeing what tax individual property owners should pay, as well as in seeing what part of the individual's tax goes to the county, state, city, school, etc., respectively. Other sources of income, such as *licenses*, *fines*, *etc.*, are touched upon.

The *county and state expenses*, met mainly by taxes and licenses, receive attention next. Meeting the *government's*

expenses completes the list in this topic. The stupendous expenses of the government are considered, the pupils bringing to class as much of such information as possible. The main source of the government's income, which is the *custom duties*, is then studied from the viewpoint of their being a protection to our industries. The reason for a *free list* is shown, and the *ad valorem* and *specific duties*, along with *invoices* of imported goods, present good material for arithmetical work. The simplest phases of the *income tax* are also studied in this connection.

The chain of topics is unbroken when the subject of *insurance* is introduced, as it is another activity concerning a group of many people.

Property insurance is studied with the following ideas in mind:

(1) In insuring property, protection is being paid for.

(2) The greater the protection required, the higher the rate should be.

(3) What increases the need for protection? Consider the location of the property involved, its condition, etc.

(4) What decreases the need for protection? The pupils bring to class as many *insurance policies* as possible. These are carefully examined, and the terms used in connection with insurance are introduced and learned by being used. The pupils are expected to gather information concerning rates of insurance on stores of various kinds, dwellings, moving picture places, etc. These rates are discussed and used in figuring premiums to be paid for places insured for various sums.

Insurance against loss by fire, burglary, tornadoes, etc., are thus studied before life insurance. *Life insurance* is considered by means of comparing a person's life with his property. The risks differ in what way? Why is a physical examination necessary? Why should the rate depend upon one's state of health? What is a life worth? A man may be insured for any amount for which he can pay. Why?

The four principal kinds of life insurance: (1) Ordinary, (2) Limited, (3) Endowment and (4) Term, are discussed.

Using real policies, problems based upon the face, rate and premium are made up.

The next series of lessons which completes this outline, while taking up new ideas, review most thoroughly every one of the preceding topics.

The class is led to follow the gradual growth of a business from its start, when it is owned by an individual, until it develops into an incorporated stock company. The pupils choose the type of business they wish to consider from a list of several selected by the teacher. The teacher is guided in making her selections by the idea of making use of as many of the previously studied business activities as possible. The sale of imported goods, for instance, needs the understanding of: profit and loss, commercial discount, commission, banking, sending money, sending goods by freight or express, custom duties and insurance.

As an illustration let us follow a class which has chosen the business of selling toys.

One man (let us call him Mr. A. J. Reynolds) owns the business. The pupils are expected to do research work, finding out reasonable rents for stores, and other overhead expenses, as well as the approximate cost of toys. The necessary capital is then decided upon.

Mr. Reynolds finds it necessary to increase his capital, so he borrows a few hundred dollars from the bank, offering security therefor.

In the progress of the development of the business, problems embodying the following ideas are worked: wholesale price invoices, custom duties, expense of sending money, expense of transportation, gross gain, net gain, rate income from the investment.

The business develops nicely. Special sales attract customers and commercial discount again appears naturally. Salesmen are engaged on the commission basis and their incomes are figured.

More capital means more business, so a *partnership* is formed. This makes it necessary to know how to divide profit or loss equitably. Splendid material for the study of ratio and proportion appears in this connection.

Realizing the advantage of a larger capital they decide to form a *stock company*. By careful guiding and helpful sug-

gestions the following terms are understood and *then* the names are given: stock, shares, becoming incorporated, preferred stock, common stock, dividends. Reasons for wanting to buy stock from a stockholder come up, as well as reasons for a stockholder's desire to sell his stock. Then reasons for increased or decreasd values of stock are realized. Again use is made of the newspaper. This time the stock quotations are studied. The meanings of par value, selling stock above or below par, rate of income from an investment are brought out. A stock broker's manual, aiding in deciphering the various stock abbreviations and giving information concerning the companies, is used along with the newspaper.

The study of these reports in newspapers of several successive days shows how the values fluctuate, and lessons concerning the uncertainty of stock values are pointed out. The explanation of "bulls," "bears" and "the shorn lambs" make interesting, but not very attractive, the investment of one's earning's in stock, especially when it is not listed.

Our company wants to raise money to pay a debt or to buy a store or for some other legitimate reason. Hence it borrows money, giving its promissory note to the loaner. This note is a *bond*. Taking care of a large loan by issuing several *bonds* is explained. The difference between a *registered bond* and a *coupon bond* is taught. The manner of receiving the interest is shown in each case. *Municipal bonds* and *government bonds* are studied also. The newspapers show that bonds also are bought and sold at fluctuating prices.

The necessity for knowing an investor's *rate of income* is brought out and other investments are used as a source of study.

The series of lessons following "insurance" is of a character such that problems of a cumulative sort are used almost exclusively, causing independent thinking and introducing the pupil to natural business situations.

All of this material may be used to advantage in carrying out the fundamental aims of mathematical teaching as announced by the National Committee on Mathematical Requirements. In its preliminary report of our Junior High School Mathematics, at the bottom of page 4, we read, "The primary

purpose of the teaching of mathematics should be to develop those powers of understanding and analyzing the interdependence of quantities . . . which are necessary to a better understanding of life and of the universe about us, and to develop those habits of thinking which will make those powers effective in the life of the individual."

In planning this outline, the desire has been to eliminate as much of the artificial as possible, and to develop the understanding of life situations in the most natural way.

It is realized that this outline is devoted exclusively to the *one* phase of socialized arithmetic which arises in business situations, while there are other lines of work equally rich in useful arithmetical material. The arithmetic of science, both theoretical and applied, as well as the computations necessary in technology and industrial life, are sadly neglected in our schools. It is hoped that these other branches may, with the expansion of the curriculum, receive adequate attention, not, however, at the expense of the business arithmetic with which everyone should be very familiar.

The sole aim of this paper is to call attention to an *organic* presentation of worth-while business problems which has been thoroughly tested in a large number of classes.

FLORENCE M. BROOKS.

FAIRMOUNT JUNIOR HIGH SCHOOL,
CLEVELAND, OHIO.